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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

April 17, 1995

Mr. William F. Caton  
Secretary  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, DC 20554

Re: Reply Comments ; IC Docket No. 94-31

Dear Mr. Caton:

Transmitted herewith, on behalf of Iridium, Inc., are nine corrected copies of Iridium, Inc's reply comments in the above-captioned matter. The original was filed April 14, 1995.

The corrections are non-substantive.

They are:

- (1) Addition of a Table of Contents
- (2) Page 5, line 7, delete the word "one"
- (3) Page 19, line 7, "os" changed to "of"
- (4) Page 19, line 7, line changed to read: "which coordination is necessary. This methodology is a mathematically unassailable."
- (5) Page 19, line 10, "arc" not "are"
- (6) Page 26, line 16, add the words "band" after "MHz", "necessarily" after "not".

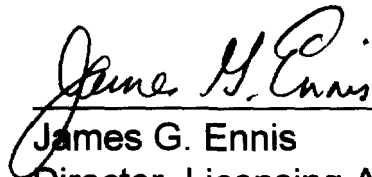
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- (7) Page 26, line 17, add the word "band" after "MHz"
- (9) Page 29, line 1, delete the \* beside Footnote 22
- (8) Page 29, line 16. Add the word "only" between "not" and "a"

Should there be any questions concerning this matter, please contact the undersigned.

Very truly yours,

  
\_\_\_\_\_  
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**IC Docket No. 94-31**

## **REPLY COMMENTS OF IRIDIUM, INC.**

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**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of	)	
	)	
Preparation for International	)	IC Docket No. 94-31
Telecommunication Union	)	
World Radiocommunication	)	
Conferences	)	

**REPLY COMMENTS OF IRIDIUM, INC.**

Iridium, Inc. ("Iridium") hereby offers its reply comments in response to the Comments filed in connection with the Commission's Second Notice of Inquiry ("Second NOI") released January 31, 1995 in the above-captioned proceeding.

**INTRODUCTION AND SUMMARY**

Mobile satellite service (MSS) issues for WRC '95 fall into two categories: improving existing MSS allocations and providing additional spectrum for MSS systems. With respect to improving existing allocations, the improvements contemplated relate both to the current procedures for coordinating MSS systems and to the

current allocations for MSS service links, feeder links, and intersatellite links. Because the U.S. has already issued licenses to use some current MSS allocations, and because MSS systems are already under construction in these bands, there is an immediate need to improve these existing allocations for MSS use. This should be the highest priority of the U.S. at WRC '95.

The second category of issues deals with the need for new spectrum for MSS subscriber links, feeder links, and intersatellite links. Given the long lead time required for the U.S. to develop rules for use of new MSS spectrum, to assign it to individual licensees, and for these licensees to construct licensed satellite systems, it is not too early to secure additional spectrum at WRC '95 to meet the needs of future generations of MSS systems. Obtaining sufficient new MSS spectrum should therefore also be a high priority at WRC '95.

As a general matter, the U.S. should strive to resolve all MSS issues at WRC '95. Iridium recognizes, however, that some spectrum/allocation issues may not be ripe for consideration at WRC '95. In this event, even if certain issues may not be susceptible to

resolution at WRC '95, the U.S. should endeavor to lay the foundation at WRC '95 for success in 1997. Given the lead time involved, WRC '97 may well be the last opportunity to obtain new MSS spectrum to meet the needs of future generations of MSS systems. It would be much better to take advantage of the two opportunities presented by WRC '95 and WRC '97 rather than to rely entirely on WRC '97 alone to obtain needed additional MSS spectrum.

#### **I. IMPROVEMENTS TO CURRENT ALLOCATIONS**

The U.S. government should place most emphasis at WRC '95 on making modifications to the current MSS allocations that are necessary to facilitate their use by authorized MSS licensees. The most important changes needed are to the FSS allocations used for feeder links for MSS systems. Improvements also need to be made to existing coordination procedures under Resolution 46 and to the allocations for MSS subscriber links at L-band.

**A. Improvements to Current MSS Spectrum Allocations:**

**Feeder Links**

- 1. No Information Has Been Presented In the Comments Which Should Dissuade the U.S. From Going Forward with a Proposal to Designate the 19.2-19.7/29.0-29.5 GHz Bands for Use by Non-GSO MSS Feeder Links**

As the Commission recognizes in the Second NOI, "obtaining sufficient NGSO feeder link spectrum for 1.6/2.4 GHz 'Big LEO' MSS networks is critical for the introduction of those networks in the U.S. and globally." To this end, Iridium endorsed in its initial comments the second of two options identified by ITU-R Task Group 4/5 for accommodating non-GSO MSS feeder links in bands above 17.7 GHz. Under this option, a footnote would be added to certain sub-bands identified for use by non-GSO MSS feeder link networks pursuant to which: (1) RR 2613 would not apply; (2) existing GSO FSS networks would have equal status; and (3) future GSO FSS systems would have to protect notified non-GSO MSS feeder links. In the Second NOI, the Commission identifies 19.2-19.7 and 29.0-29.5 GHz as appropriate sub-bands to which such a regulatory footnote could apply. Iridium wishes to emphasize that this approach

is favored by the international community as evidenced by the fact that the Conference Preparatory Meeting Report to WRC-95 recommends this as the preferred option for satisfying Ka-band non-GSO MSS feeder link requirements.<sup>1</sup>

In their comments, a number of GSO FSS interests argue that non-GSO MSS systems should not be using Ka-band spectrum for their feeder links because sufficient spectrum is available below 17.7 GHz.<sup>2</sup> Several of these commenters contend that, if a portion of the Ka-band must be used for non-GSO MSS feeder links, then (1) the amount of spectrum made available should be less than the 500 MHz in each direction proposed by the Commission;<sup>3</sup> (2) non-GSO MSS operators must agree to accept certain operating constraints that would purportedly enable them to share the band on a co-frequency basis with GSO FSS systems<sup>4</sup>; and (3) Ka-band feeder links must

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<sup>1</sup> Document CPM 95/118-E (4 April 1995) at 157.

<sup>2</sup> See Comments of Hughes Space and Communications Company ("Hughes") at 5 and GE Americom at 5.

<sup>3</sup> See Comments of Hughes at 6, GE Americom at 2-3, and Comsat World Systems Division ("Comsat WSD") at 7-8.

<sup>4</sup> See Comments of Hughes at 6-9.

remain subject to RR 2613.<sup>5</sup> For the reasons set forth below, each of these arguments should be rejected.

First, neither Hughes nor GE Americom provide any information to support their claims that there is sufficient spectrum below 17.7 GHz to accommodate non-GSO MSS feeder links.<sup>6</sup> To the contrary, those non-GSO MSS systems seeking feeder link spectrum below 17.7 GHz have had an extremely difficult time in that endeavor. In fact, given those difficulties, the Commission has indicated that all non-GSO MSS licensees may have to use the Ka-band to satisfy their feeder link requirements.<sup>7</sup>

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<sup>5</sup>See also Comments of Hughes at 10-14, GE Americom at 2.

<sup>6</sup>Hughes asserts that GSOs can use the Ka-band more efficiently than non-GSOs because of their ability to reuse a given band segment through 2 degree orbital spacing. Comments of Hughes at 6. Iridium believes that the beamwidths employed by a Spaceway-type VSAT system are too wide to allow this degree of reuse and, therefore, would result in interference to adjacent satellites. In addition, and more importantly, even if Hughes could reuse spectrum with 2 degree orbital spacing, then it should be able to satisfy its asserted need for 1000 MHz for the Spaceway system in North America through 2 degree spacing of its two proposed North American satellites. This would enable Hughes to reuse the 500 MHz at 29.5-30.0 GHz, which, according to Hughes, is the portion of the Ka-band most "uniquely suited to support ultra-small earth terminals." Comments of Hughes at 15.

<sup>7</sup>See Second Notice of Proposed Rulemaking, CC Docket No. 92-297, FCC 94-12 (rel. Feb. 11, 1994) at para. 22; Notice of Proposed Rulemaking, CC Docket No. 92-166, FCC 94-11 (rel. Feb. 18, 1994); Report and Order, CC Docket No. 92-166, FCC 94-261 (rel. Oct. 14, 1994), at para. 169.

Second, the fact that multiple non-GSO MSS systems may have to use Ka-band to satisfy their feeder link requirements is one of the reasons why 500 MHz in each direction must be made available for non-GSO MSS feeder links both in the U.S. and abroad.<sup>8</sup> This includes not only presently licensed or proposed non-GSO MSS systems, but also future non-GSO MSS systems, both in the U.S. and abroad. As recognized in the Interim Report of the IAC, sharing studies to date are inconclusive with respect to whether more than two non-GSO MSS feeder link networks can operate on a co-frequency basis. In this regard, it must be borne in mind that, apart from the potential for having multiple non-GSO MSS feeder link networks at Ka-band, there will be numerous GSO FSS and Fixed Service networks in the 19.2-19.7/29.0-29.5 GHz bands with which coordination will be necessary. Some amount of otherwise available non-GSO MSS feeder link spectrum will inevitably be lost in this process.

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<sup>8</sup>GE Americom claims that non-GSO MSS feeder link spectrum requirements in bands above 16-GHz can be reduced by 50% by employing dual polarization. Comments of GE Americom at note 2. As noted in CPM Report to WRC-95, however, use of dual polarization is not likely to be feasible in the 16-30 GHz range. Document CPM 95/118-E (4 April 1995) at 41.

Third, as for sharing between non-GSO MSS feeder link and GSO FSS networks, Hughes bases its claim that such sharing is feasible on the conclusions of TG 4/5 and on additional sharing studies that Hughes has sponsored in recent months.<sup>9</sup> However, as Hughes recognizes, TG 4/5 concluded that sharing is feasible only if certain operational constraints are imposed on non-GSO MSS feeder link networks. Hughes asserts that these operational constraints "would have little or no impact on Iridium and TRW and would maintain the required system availabilities."<sup>10</sup> This is simply not true. As explained in the attached paper entitled "Review of CPM 95 Sharing Studies between 20/30 GHz GSO/FSS networks and NGSO Feeder Links for MSS Operating in the 1-3 GHz Spectrum" (Attachment 1 hereto), the type of operational constraints or mitigation techniques that have been identified by Hughes and others either would not work or cannot practically be implemented.

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<sup>9</sup>Comments of Hughes at 6-10. It should be noted that another GSO interest, GE Americom, maintains that such sharing is not feasible. See Comments of GE Americom at 3,5.

<sup>10</sup>Comments of Hughes at 8.

Further, Hughes' own sharing studies actually demonstrate the reverse of what they are intended to show, that is, they demonstrate that sharing is not feasible because the studies themselves are predicated upon the implementation of certain interference mitigation techniques by the non-GSO MSS operator.<sup>11</sup> Again, as explained in Attachment 1, the use of these techniques would not allow the IRIDIUM® system to meet its service objectives.

Iridium also wishes to emphasize that a fundamental concern it has with a codirectional sharing approach is the uncertainty and attendant risk posed by unbounded sharing with GSO FSS systems. As the number of GSO FSS systems in the subject bands increase, there is a very real risk that feeder link operations, which, in the case of the IRIDIUM® system, require very high levels of reliability, will be subject to interference. Even if, in theory, a non-GSO MSS operator had first-in-time interference rights (assuming RR 2613 did not apply), the burden of coordinating with numerous VSAT systems would be enormous and, as a practical matter, perpetual. Moreover,

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<sup>11</sup>GE Americom concedes in its comments (pp. 3 and 5) that sharing between non-GSO MSS feeder links and GSOs is not feasible.

the ability of a non-GSO MSS operator to detect the exact source of interference from among multiple VSAT networks and to enforce its interference rights would be questionable at best. A commercially viable, multi-billion dollar global non-GSO MSS system simply cannot take this risk or accept such on-going regulatory uncertainty.

Finally, Iridium disagrees with Hughes' contention that RR 2613 must be maintained in all FSS bands. Hughes' contention is based on the arguments that the policy behind this provision is still relevant (i.e., the need to give GSO satellite services absolute protection while allowing non-GSO satellite systems to use FSS bands only to the extent that they do not interfere with GSO satellite systems) and that otherwise non-GSO satellite systems will have no incentive to avoid interfering with GSO satellite systems.<sup>12</sup> To the contrary, the policy behind RR 2613 has outlived its usefulness as satellite technology has evolved and non-GSO satellite systems become more prevalent. Hughes offers no sound public policy reasons why GSOs should continue to be given primacy in all FSS bands.

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<sup>12</sup>Comments of Hughes at 10-11.

Further, Iridium is not arguing that existing GSO networks should not be protected and have priority over new non-GSO systems. Existing GSOs should be protected not because they are GSOs, but because they are already operational and have international status at the ITU. As for the Hughes contention that there should be an incentive for non-GSOs to avoid interference to GSOs, there is simply no basis for maintaining a system where all the burdens of sharing fall on non-GSOs. Non-GSO protection of GSOs should be based not on a one-sided set of incentives, but on rights determined by the ITU coordination process. As the Commission correctly recognizes in the Second NOI, RR 2613 "appears to place the burden of interference avoidance primarily on the NGSO MSS network, even where the interference is the result of a later-established GSO FSS system."<sup>13</sup>

- 2. The Commission Must Not Allow Teledesic to Undermine U.S. Proposals to Accommodate the Feeder Link Requirements of Non-GSO MSS Systems in the 1-3 GHz Range at WRC-95 and Should Instead Propose that the Agenda for WRC-97 Address Non-GSO FSS Use of FSS Allocations Between 17.7 and 59 GHz**

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<sup>13</sup> Second NOI at 19. See also Comments of Teledesic at 8.

Teledesic argues that WRC-97 will be too late to establish a primary allocation of spectrum for non-GSO satellite networks in order to accommodate both its needs and non-GSO MSS feeder link needs.<sup>14</sup> As TRW notes, however, Teledesic has attempted to recast its service link proposals as non-GSO feeder links in order to have its non-GSO FSS proposal considered at WRC-95. Any concession to Teledesic in the U.S. WRC-95 proposals could jeopardize new allocations for true non-GSO MSS feeder link systems.<sup>15</sup> Iridium agrees with TRW for the same reasons set forth in its initial comments.<sup>16</sup>

Issues pertaining to non-GSO FSS allocations for service links should instead be considered at WRC-97. Iridium believes, however, that the agenda item covering this issue should be broader than the one proposed by Teledesic, which would limit WRC-97's consideration of this issue to the Ka-band.<sup>17</sup> In Iridium's view, this

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<sup>14</sup> Comments of Teledesic at 19-20.

<sup>15</sup> Comments of TRW at 13, n. 23.

<sup>16</sup> Comments of Iridium at 14.

<sup>17</sup> Comments of Teledesic at 20-21.

agenda item should cover any FSS allocations above 17.7 GHz, at least up to 59 GHz. Given the number of satellite and terrestrial interests currently vying for Ka-band spectrum and the present uncertainty as to how those issues will be resolved, it would be short-sighted to limit the scope of any WRC-97 agenda item dealing with non-GSO FSS systems to the Ka-band only. By broadening the agenda item to include any FSS allocations above 17.7 GHz, the U.S. and other administrations would have greater flexibility in accommodating the needs of non-GSO FSS systems. Indeed, as lower bands allocated to the FSS become increasingly congested, FSS allocations in the 37.5-59-GHz range will be the next available bands for the implementation of such systems.

**B. Improvements to Current MSS Spectrum Allocations:**

**Subscriber Links.**

1. Iridium continues to support the Commission's proposal to change RR 731E in the ITU Radio Regulations to make it clear that the EIRP power density values presented therein are "mean" values. In that connection, Iridium notes that the CPM Final Report

(at 18) proposes to modify RR 731E to make it clear that the value -3dB(W/4kHz) in RR 731E is a mean, not a peak, value. The CPM Final Report recommendation on this subject is acceptable to Iridium.

So far as Iridium can see, there is no technical justification for the "peak" to "mean" ratio that LQP proposes in its comments (at 8) and LQP offers none. In connection with establishing a definition of "mean", Iridium notes that the WRC '97 agenda proposes to address ITU Recommendation 66, which recommends that the definition of "mean" should be studied. Since this is a complex issue as to which little thought has been given, it should be considered at WRC '97, not WRC '95.

2. Deleting RR 733. Constellation proposes in its comments (at 5) to delete RR 733, a global footnote which permits AMS(R)S services in the 1610-1626.5 MHz band. Iridium, Inc., opposes this proposal. Deleting AMS(R)S removes flexibility at a time when new systems need to be able to explore the widest possible range of service opportunities.

3. Global Market Access. ESD-USA filed comments in this proceeding requesting that the U.S. agree to give all MSS systems,

including the Russian Elekon-Stir system, access to the U.S. market. Although Iridium expresses no opinion on the merits of this proposal, it believes that the issue that ESD-USA raises is far outside the scope of this proceeding, which is to formulate the U.S. position on issues on the agenda for WRC '95.

**C. Improvements to Coordination Procedures.**

1. **Resolution 46 should continue to exist as a stand-alone document.** From discussions at the WRC '95 Conference Preparatory Meeting (CPM), it now appears that it may not be possible to review and adopt the VGE simplified regulations during the Conference. In that event, the VGE simplified regulations would not take effect until after the next WRC, in 1997. To protect against this contingency there needs to be an agreed-upon methodology during the interim period for coordinating MSS systems. To serve this purpose, a modified Resolution 46 should continue to exist as a stand-alone document until the VGE simplified regulations are adopted.

2. A number of changes need to be made to Resolution 46 in order to facilitate the process of coordinating MSS systems with each other and with other services with which they share spectrum.

In its initial comments, Iridium supported most of the changes to Resolution 46 that the Commission identified in paragraph 41 of Second NOI, and suggested some changes to the VGE simplified regulations as well.

One of the Commission's proposals was to modify Resolution 46 to provide a specific method to calculate coordination regions pursuant to paragraphs 2.1 and 2.2 of the Resolution (Second NOI, at para. 41). Iridium supports this position and believes that procedures utilizing the methodology described in Recommendation ITU-R M [Doc. 8/45]<sup>18</sup> for determining "affected" systems with which MSS systems must coordinate, should be attached to Resolution 46 as an annex to achieve this objective.

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<sup>18</sup>"Calculation of the affected region for a mobile satellite service (MSS) network subject to Resolution 46 where coordination is to be effected between space station assignments and co-frequency MSS, fixed service (FS) and mobile service (MS) ground-based stations of other administration," Recommendation ITU-R M [Doc. 8/45].

Loral/Qualcomm Partnership ("LQP") seems to believe that providing a specific method to calculate coordination regions somehow "confers additional status" on the secondary space-to-Earth MSS allocations in the band 1613.8-1626.5 MHz (LQP Comments, at 26 et seq.). This is not the case. The methodology in Document SG8/45 for determining "affected regions" for coordination purposes reduces the number of co-frequency assignments with which coordination is necessary. This methodology is a mathematically unassailable method of calculating the area covered by an MSS satellite's field of view when it is in its active service arc, within which other systems may be affected.

The U.S. proposal to WRC '95 should follow the Final Report of the CPM and propose that procedures utilizing Document SG8/45 be added to Resolution 46 either as an annex or by reference to a recommendation. In that connection, the U.S. should support having Study Group 8 adopt Document SG8/45 at its next meeting in June, 1995.

3. Iridium supports another change the Commission proposed, to replace Section 2.5 of Resolution 46 (coordination with

terrestrial systems). Iridium notes in this connection that the CPM Final Report (at Section 1.4.6.4(b), p. 27) supports this position and identifies the relevant Study Group 2 recommendations. Iridium believes the text of these recommendations should be incorporated either by reference or as annexes to Resolution 46.

4. Iridium supports the Commission proposal that new information be required in Appendix 3 filings. However, in addition to the items identified by LQP in its comments on this issue, the Appendix 3 filings should contain one other item. This is the number of co-frequency CDMA signals in each beam. For the purpose of determining whether a system exceeds the threshold value of RR 2566, the maximum number of users, per frequency, per beam should be provided in the Appendix 3 data, because this is the figure that accurately reflects the potential for interference to terrestrial based systems. Multiple satellites in the same constellation covering the same point on the ground should not exceed this pfd limit at that point. If they do, an aggregate value should be provided instead of the value for a single satellite.

5. In its initial comments, Iridium recommended that Resolution 46 be modified to state that administrations must respond to a Radiocommunication Bureau publication of notice of a new MSS satellite system within six months or be deemed to have "consented by default" to the proposal. Iridium notes that the CPM Final Report (at Section 4.2.6.3 (e) of attachment 1 to Chapter 4, at 167) proposes language to this effect. The U.S. should support the CPM proposal in this regard.

6. Indium also proposed in its initial comments that provision S9.30 of Part B of the VGE Report be modified to permit requests for coordination to be sent to the Radiocommunication Bureau. The CPM Final Report (at 102) proposes to modify S9.30 to achieve that purpose. The U.S. should support this change.

7. Although there was opposition expressed at the CPM to the concept of incorporating technical standards into the Radio Regulations, Iridium continues to believe that the concept of "incorporation by reference" is a valid proposal which would simplify the radio regulations.

## **II. NEW MSS SPECTRUM ALLOCATIONS**

### **A. Maritime Band MSS Allocation.**

In its initial comments, Iridium urged the Commission to seek to have the GMDSS requirement in RR 726C deleted for the 5 MHz band from 1626.5-1631.5 MHz. AMSC comments that the GMDSS footnote (RR 726C) should be added to the downlink band 1626.5 - 1631.5 MHz so that "the maritime community will have greater assurance that there will be adequate priority spectrum available to meet all of its distress and safety communications (AMSC, at 6).

The maritime community's need for GMDSS is already amply met by the 28 MHz of spectrum<sup>19</sup> reserved for this purpose in the 1530-1544/1631.5-1645.5 MHz bands. As has been well documented in this proceeding, the challenge facing the Commission is to find more unencumbered MSS spectrum, not more GMDSS spectrum. Adopting Iridium's proposal would not affect the GMDSS system, while substantially improving the amount of spectrum available for global MSS.

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<sup>19</sup>In the Inmarsat system, this represents over 500 duplex channels in each ocean area. This would seemingly be more than sufficient to accommodate multiple simultaneous maritime disasters.

**B. Metsat/Metaids Band: Co-Primary in All ITU Regions.**

Iridium was joined in its support of the Commission's proposal to extend the MSS co-primary allocation in the 1675-1710 MHz band to Regions 1 and 3 as well as Region 2 by LQP (Comments at 29), TRW (Comments at 11 and 19), Constellation (Comments at 10, n.24), AMSC (Comments at 11), and Comsat Mobile (Comments at 20).

Iridium does not agree with Constellation that this band should be reserved for GSO's only. At this time, it is not clear where global non-GSO systems will be able to find additional spectrum. There are technical and/or regulatory difficulties associated with all the bands that have been identified for next generation non-GSO MSS systems, including the 2 GHz band (which Constellation in its Comments (at 10) proposes be limited to non-GSO systems). The Metsat/Metaids band seems to be one of the most promising bands for future use by non-GSO MSS systems and Iridium opposes limiting MSS access to this band to GSO MSS systems.

Iridium also does not agree with the view expressed by Comsat Mobile that a paired downlink band must be identified to go with an